

Mathematics saves the day

Students in a year five class read stories with embedded mathematics themes and engaged in related activities over a three month period. Class discussions became a regular part of the lessons and students enjoyed sharing their ideas and “findings.” Following each story and activity, students were asked to write a reflection about the associated mathematics learning. The enthusiasm and range of mathematical concepts that are made more accessible and memorable as a result of reading stories is impressive.

Enhancing learning

Many people believe that the 1989 National Council for Teachers of Mathematics (NCTM) standards heralded the biggest mathematics reform of the 20th century (Kaufman, 2001). Despite all reform efforts, recent studies indicate that mathematics taught in primary and middle school mainly consists of basic arithmetic tasks that use memorization and repetition (Kaufman, 2001). Today many students perform adequately on basic computational tests but have difficulty

in applying mathematics knowledge to problems. Furthermore, it is apparent that an inordinate amount of time is spent on low-level procedures rather than on reinforcing conceptual understanding (Good, Mulryan & McCaslin, 1992).

An expectation for students to act as mathematicians is encouraged by the NCTM in the new *Principles and Standards* (2000). Most mathematics educators recognise the need for students to be engaged in meaningful and interesting mathematical activities. Unfortunately, many teachers do not present mathematics in ways that are meaningful to their students. Banchoff (2000) suggests that authentic projects allow students to become genuine mathematicians. In addition Banchoff states that students need to learn that finding solutions is frequently not an automatic process.

The vehicle of children’s literature emerged in the author’s search for pedagogy that enhances students’ learning of mathematics. What follows is a brief description of previous research in this area and a discussion of a Year 5 classroom that used children’s literature to support mathematics learning.



Julie Clark
discusses how
using stories
can engage
students in
thinking about
mathematical
ideas.

Making links

Links between language and learning are evident in varying degrees across all subject areas. Moyer (2000) emphasises the strong connections between learning mathematics and use of language. Language skills are necessary for children to effectively think and communicate mathematically. In fact Moyer states that “the separation of language and mathematics instruction is very unnatural for children” (p. 253).

In addition, students benefit from learning mathematics in authentic and interesting contexts. Children’s literature brings together both language and context in an engaging format. According to Lowe and Matthew (2000), children’s literature illustrates mathematics within contexts that make sense to children. In addition, children are able to view mathematics as a natural part of life, not just as difficult classroom problems (Lowe & Matthew, 2000; Usnick & Maxson, 1996). Children’s literature provides mathematical ideas in real contexts and gives opportunities for rich problem solving (Forbringer, 2004).

Children’s literature is an ideal way to meet diverse needs in a classroom (Forbringer, 2004). Jenner adds “literature... appears to give children a highly personal learning experience in which they can enter the story at their own levels of mathematical curiosity” (2002, p. 160). Mathematical discourse, arising from children’s literature, provides opportunities for students to communicate mathematically and to justify their reasoning and enables students to gain awareness of other perspectives (McDuffe & Young, 2003).

Children’s imagination and creativity are stimulated through reading interesting and exciting stories. Jenner states that she “was impressed by the complexity of the children’s mathematical thinking and the abstractness of their mathematical ideas during the reading...” of mathematics children’s literature (2002, p. 168). McDuffe and Young (2003) explain that children’s literature can provide illustrations of mathematical applications used to achieve life goals. Moyer (2000) states the problems incorporated within stories allow children to understand that real world

problems are often ‘messy’ and may have many legitimate solutions.

Reading the story

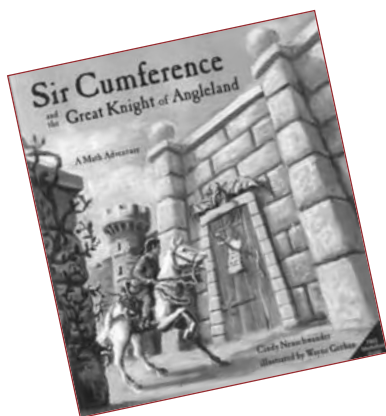
The class was team-taught by two teachers, each teaching two and a half days per week. The teachers shared a constructivist approach to learning. Pedagogical decisions centred on student needs and interests. I was invited to the class, as a mathematics educator, to share mathematics-related activities once a week throughout the year. The thirty-one Year 5 students involved in this project represented a wide cross-section of abilities, interests and ethnicities. Some students enjoyed tackling challenging mathematics problems, while many were disenchanted with mathematics and avoided it whenever possible.

This article will focus on one of these stories. Two of the strands in mathematics are measurement and spatial sense & geometric reasoning and in Year 5 students learn specific details about angles and properties of shapes. The teachers were concerned about students’ knowledge and understanding of angle and shape properties. They had previously studied them but not all students had maintained interest in the concepts. With this in mind I selected a book by Cindy Neuschwander called *Sir Cumference and the Great Knight of Angleland*. This book is one of a series of five that begins with *Sir Cumference and the First Round Table*.

Before reading, I asked the students to take note of any mathematics in the story. If you haven’t read these books, I highly recommend them to you. Sure they are corny, but the students and I loved them! A brief synopsis of the story follows. Radius, a young knight in training, sets out on a quest to find and rescue King Lell. Along the way he faces danger and solves puzzles using a mysterious medallion (a protractor). As a result of his success the kingdom is renamed Angleland (now known as England).

The story immediately captured the students’ imaginations. As concepts were

embedded throughout the story, I paused after a few pages to allow the students to share their observations concerning mathematics in the book. This presented ideal opportunities to address concepts, such as circumference, with which many students were unfamiliar.



At one stage, I passed around the medallion that came with the book. I was delighted to see the students gazing at it with wonder. In fact, the medallion was a decorated cardboard protractor! This is a great way to engage students' interest in using a protractor. We laughed about a cute village with steep roofed houses and the Mountains of Obtuse.

Later in the story, some students used mathematical knowledge to hypothesise about the ending. As Radius solves the riddle using his medallion, the students are able to see a protractor in action. Radius successfully completes his quest by rescuing King Lell and his pets (the Lell dragons). When the King shouted Pair of Lells the dragons would form a living drawbridge by lying side by side across the moat. "They became so famous that today parallel means any straight lines side by side" (Neuschwander, 2001, p. 32).

After the story

Students were asked to write reflections about the story for homework that night. Next time we were together students shared their reflections as a group. Perhaps the most memorable comment came from a capable but often disengaged student. Alec said that he learned that "Maths saves the day." He went on to explain that mathematics skills had enabled Radius to solve the riddle and complete his quest. This was then likened to the connection between mathematics and everyday life.

Many students commented that the story was both funny and clever. Mary wrote, "I think it is amazing how someone has made this book! It is great how it makes you remember hard things easy!" Another student wrote, "It was very informative and fun to count how many names were also used in maths." Other students commented on specific parts of the story such as "I liked when Radius was stuck in the maze because it was exciting." Danielle wrote, "I like the part when the Lell dragons make a bridge and they named it parallel". Debbie wrote "I liked the cute village and how they make a play on words to make the story maths."

As teachers we were excited to observe specific students engaged in a subject for which they often expressed disdain.. Following the success of the story, students began to explore angles and circles. We began with an angle scavenger hunt and continued to build on the concepts found in the story with a variety of related activities. Students were tasked with finding examples of different types of angles in the classroom environment.

The range of angles found by the students was impressive. Some students discovered ways of manipulating the environment to display a variety of angle types. For example, a pair of scissors can be opened to demonstrate different angles. Other students used the hands of the clock to show acute, obtuse, straight and reflex angles.

Conclusion

Throughout the year, the class continued to read stories with embedded mathematical concepts. The students were motivated to undertake a variety of mathematical investigations after reading imaginative and entertaining stories. Eventually, the students were requesting additional mathematics lessons.

“Can we please do some mathematics today? Do you have any new books?” asked a group of year five students.

This experience of using stories to teach mathematics has motivated me to expand my children’s book collection. I have found the stories to be effective for students from R – 10. A colleague and I are in the process of developing learning outcomes and activities to accompany the stories.

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Julie Clark
Flinders University, SA
<julie.clark@flinders.edu.au>

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